

problem than the one actually posed there: Which transport aircraft already developed should we procure for our fleet? And while the quantitative analysis used for the latter problem gives information that is needed for good development decisions, it does not by itself point to the best choice.

All that the Chapter 8 analysis does is to estimate that the HC-500, if successfully developed, promises gains (that is, savings) of about \$300 million (aside from the worth of advances in the state of the technological art that may accrue to other military or industrial activities); and that the HC-600, if successfully developed, promises savings of about \$500 million. These estimates are themselves, of course, subject to great uncertainty. The uncertainties are inevitably greater at the time development decisions must be made than at the time the procurement decision is made, for the period covered by the analysis must lie further ahead of the development decision than of the procurement decision.

But quite apart from these uncertainties, with the general character of which we are by now familiar, there are other relevant uncertainties and gaps in the information provided by the analysis. What we need to know are the potential payoffs and the costs *of the development decisions under consideration*. Let us concentrate for the moment on the first of these questions: Which aircraft should we develop?

The analysis does not even give us the expected payoff from development, because it simply assumes that the development will be successful. In fact the probability that any particular development will be successful is never unity, and usually much less. It has been estimated that half the aircraft developed in the United States since the war — military and civilian — have been, in the vernacular of the industry, “dogs” — not merely somewhat inferior to some other aircraft, but wrongly conceived, technically unsatisfactory, failures. The *expected* value of a development will always be less than the potential value as calculated in Chapter 8, and sometimes much less.

Even if the aircraft is not a dog, its performance characteristics may well be less than predicted and its production costs greater, particularly if the predictions are based, as they usually have to be, on the claims of the company bidding for a development contract. Occasionally performance characteristics are better than predicted, but this is much less common;¹⁸ costs are always greater. An optimistic bias is general. To the extent that performance is disappointing or estimated costs are exceeded, the payoff will be less than estimated in Chapter 8.

The corrected estimate of payoff must then be compared with the estimated costs of development, which were properly ignored as bygone

¹⁸ Sometimes, however, there turn out to be unforeseen *applications* which make a development more valuable than anticipated.